

XX. *An Account of the Effect of Electricity in Shortening Wires.* By Mr. Edward Nairne, F. R. S.

Read May 11, 1786.

EVERY new fact in a science being an acquisition to it, I beg leave to lay before this Society the following discovery, which I made some time ago, relative to electricity shortening wire by its passage through it. The following experiment I hope will clearly illustrate it.

EXPERIMENT.

I took a piece of hard-drawn iron wire, ten inches long, and one hundredth of an inch in diameter. This wire was held in a perpendicular position between two brass pinchers, the upper one of which was connected with a glass pillar, in order that the whole charge of an electrical battery might pass only through the wire fastened between them. These upper pinchers were moveable, for the sake of slackening the wire occasionally; and, in the experiment, they were fixed with
a screw,

a screw, so that the wire hung somewhat loose between them and the lower ones. I then charged a battery, containing twenty-six feet of coated surface, till the index of the electrometer was raised to fifty degrees: it was then discharged through the wire, and, immediately after, the wire was seen to shorten by its drawing nearer to a straight line between the fixed pinchers. If the wire was put so loose that the moving of the upper pinchers three quarters of a tenth of an inch, or seventy-five thousandths, would draw it just straight, one discharge of the battery through it would then draw it to a straight line. I discharged the same battery nine times through a piece of the same wire, which was also of the same length, which was slackened each time before the discharge went through it. There were present Sir JOHN PRINGLE, the hon. Mr. CAVENDISH, Mr. SMEATON, the Rev. Mr. MICHEL, Mr. RUSSEL, and Mr. WHITEHURST. After the sixth and ninth time Mr. SMEATON measured the wire, and found it to have shortened in the proportion of three quarters of a tenth of an inch each time.

I afterwards discharged the battery six times more through the same piece of wire, which made fifteen times in the whole, and found it had continued shortening nearly in the same proportion, the wire having been shortened by the fifteen strokes full one inch and one tenth,

tenth, *viz.* its whole length being now barely eight inches and nine tenths instead of ten inches that it was at first. I then weighed it in a pair of scales that would turn with less than the eighth part of a grain; but could not perceive, that there was any sensible difference in the weight. I tried it with a pair of callipers, and it seemed to be rather thicker.

I intended to have passed several more discharges of the battery through the wire, but the sixteenth melted it.

I have likewise shewn this extraordinary effect of electricity to Dr. PRIESTLEY, Mr. MAGELLAN, and several other gentlemen, in whose presence I passed six discharges of the same battery through a piece of the same wire, exactly ten inches in length; and on measuring it, it was found to be shortened four tenths and a half of an inch, which is just three quarters of a tenth for each discharge. Dr. PRIESTLEY then took a piece of the same wire, of exactly the same length, and heated it red-hot in the common culinary fire. This wire being afterwards measured was found to continue of its original length of ten inches, not being in the least shortened.

I have generally found, that if the iron wire was first annealed in the culinary fire, the same strength of charge melted it.

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